




Thismia panamensis (Standl.) Jonker (Thismiaceae): first record for southern Brazil

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Abstract

A new southernmost record of *Thismia panamensis* (Standl.) Jonker in Brazil extends the occurrence of this species to the Atlantic Rainforest. This species was found in Parque Estadual Serra da Baitaca, in Paraná state, where other new records of mycoheterotrophic plants have recently been made. The new record highlights the wide distribution of the species, as it occurs in different ecosystems along a significant latitudinal gradient.

Keywords

Atlantic Rainforest, saprophytes, Serra do Mar

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Introduction

Thismia Griff. (Thismiaceae) is a pantropical genus of mycoheterotrophic herbs with approximately 90 species (Sahut and Tosak 2021; Siti-Munirah et al. 2021). It is particularly species-rich in Southeast Asia, where a great number of new species been recently described (Yunoh and Nikong 2019; Dančák et al. 2020a, 2020b; Silva et al. 2020; Shepeleva et al. 2020; Xu et al. 2020; Sahut and Tosak 2021; Siti-Munirah et al. 2021). In the Neotropics, its center of diversity is the Atlantic Rainforest, which harbors the majority of American *Thismia* (9 out of 14 species) (Maas et al. 1986; Mancinelli et al. 2012; Voloschen et al. 2013; Silva et al. 2020). In Brazil, 13 species are reported (Flora do Brasil 2020), while in Paraná state *Thismia prataensis* Mancinelli, C.T. Blum & E.C. Smidt is the only species reported so far (Mancinelli et al. 2012; Smidt 2014).

Mycoheterotrophic plants grow in the litter layer of moist and well-preserved forests, where they occur in low-light conditions (Jonker 1938; Maas et al. 1986). Such habits may account for their poor documentation, with several species having been recorded only once (e.g., *Thismia macahensis* (Miers) F.Muell. and *T. prataensis*) and other species having significant gaps between records (e.g., *Thismia neptunis* Beccari, rediscovered after 151 years: Sochor et al. 2018) (Maas et al. 1986; Souza et al. 2019).

Some species of *Thismia*, along with other mycoheterotrophic plants like *Dictyostega* Miers and *Gymnosiphon* Blume (Burmanniaceae), have wide and remarkably disjunct distributions, which have usually been interpreted as an indication of their families' great antiquity (Jonker 1938; Leake 1994; Merckx et al. 2008). *Thismia*

panamensis (Standl.) Jonker was recently recorded from Brazil, pushing its known distribution into the Brazilian savanna (Guilherme et al. 2016). The species has now been collected further south and into yet another biome, the Atlantic Rainforest.

Methods

Periodic expeditions made to expand knowledge of the flora of Paraná state led to the discovery of an unidentified population of a mycoheterotrophic plant at Quatro Barras, in Parque Estadual Serra da Baitaca. The specimens were deposited in the EFC Herbarium (Federal University of Paraná, Jardim Botânico Campus, Brazil). Specialized literature was used to confirm the identity of the species (Jonker 1938; Maas et al. 1986) along with specialist confirmations by Hiltje Maas-van de Kamer and Paul J.M. Maas (pers. comm. 2020). Its geographic distribution was determined from Maas et al. (1986), Fuentes et al. (2009), Guilherme et al. (2016), Villaseñor (2016), GBIF.org (2021), and Tropicos (2021). The distribution map was produced using QGIS v. 3.4.1 (QGIS Development Team 2018).

Results

***Thismia panamensis* (Standley) Jonker**, Monogr.

Burm. 234. 1938. (Jonker 1938)

Figure 1

Materials examined. BRAZIL – Paraná • Quatro Barras, Parque Estadual Serra da Baitaca; 25°23'14.06"S, 049°00'34.69"W; alt. 1114 m; 04.III.2020; I. Souza 711 leg.; EFC 19525 • ibidem; 04.III.2020; I. Souza 712 leg.; EFC 19526 • ibidem; 08.III.2020; I. Souza 713 leg.; EFC 19527. Figure 2.

Identification. Mycoheterotrophic herb, hyaline, 3.5–8.0 cm high. Tuber white, ovoid to narrowly ovoid, 4–10 × 2–5 mm. Stem white, simple (seldom two), erect, 1.5 mm diameter. Leaves four, white, appressed in the apex of the stem, ovate, 1.5–2.5 × 1.0–2.0 mm. Flower solitary, upright. Floral tube whitish, urceolate, strongly zygomorphic, pilose inside, 5.0–6.0 × 4.0–5.5 mm. Throat hexagonal, 1.5 mm diameter. Annulus yellow, hexagonal, ornamented with three rows of yellow narrow lobes, 1 mm wide. Tepals just below the annulus. Shortest tepals whitish to yellowish, reflexed, ovate, apex obtuse, 2.0 × 1.5–2.0 mm. Largest tepals yellowish to brown, reflexed spreading, ovate, 0.5–1.0 mm wide, turning into a filiform appendage 6–8 mm long. Stamens six, pendulous, forming a tube just below the annulus, base sagittate, apex bilobed, 1.0 × 0.8 mm. Style cylindric, 1.5 mm long. Stigma yellow, three-lobbed, covered by colourless hairs. Fruit white, cup-shaped, 5.5–6.0 × 5.5–6.0 mm.

In the region, *T. panamensis* can be distinguished from *T. prataensis* by the strongly zygomorphic floral tube, longest tepals reflexed and spreading, and lack of depressions in the annulus (versus actinomorphic floral

tube, longest tepals erect, and a whorl of six depressions in annulus) (Mancinelli et al. 2012).

Distribution. Central America (Costa Rica, Mexico, and Panama), Amazonian regions of Bolivia, Colombia, Ecuador, French Guiana, and Peru, the Brazilian savanna (Goiás state), and the Atlantic Rainforest (Paraná state, Brazil) (Maas et al. 1986; Fuentes et al. 2009; Guilherme et al. 2016; Villaseñor 2016; GBIF.org 2021; Tropicos 2021). This species occurs to 1100 m a.s.l. in tropical rainforests of Central America to southern Brazil. Villaseñor (2016) included this species from Mexico; however, herbarium specimens and geographic coordinates could not be found online, so Mexican records were not added to the distribution map.

Habitat. The specimens were collected in a secondary dense montane rainforest, which was selectively logged. Trees high are between 15 and 20 m, and the understory consists of a stratum of small trees and shrubs. The litter layer is about 5 cm and other mycoheterotrophic species were observed in the same place (*Gymnosiphon tenellus* (Benth.) Urb., *Voyria aphylla* (Jacq.) Pers. and *Cymbocarpa refracta* Miers). The forest grows on cambisols in a Cfb climate (temperate, humid, with mild summer) (Roderjan 1994; Alvarez et al. 2013).

Phenology. Flowering and fruiting occur year-round. Maas et al. (1986) indicated that flowering extended from June to September, but in southern Brazil, the phenology of this species is more consistent with the observations of Guilherme et al. (2016), flowering from February to April and fruiting from March to May. The observed specimens were collected with flowers and fruits in March.

Discussion

Thismia panamensis has a wide distribution, occurring from tropical rainforests to semideciduous forests in savanna environments. The population in Paraná differs from that in Goiás by the flower colour (yellowish versus purplish), but other morphological characteristics are the same. With the present record, the Atlantic Rainforest now harbours 10 out of the 14 Neotropical *Thismia* species.

Another species of mycoheterotrophic plant has recently been recorded in the same conservation area, signaling that the mycoheterotrophic flora of Paraná state may still be underestimated and that additional studies of mycoheterotrophic plants should be conducted at Parque Estadual Serra da Baitaca and in the Serra do Mar mountain range (Souza et al. 2019). The occurrence of *T. panamensis* in the Cfb climate (according to the Köppen system) suggests that the distribution of this species may extend further south in tropical rainforests under 1000 m (Köppen 1948; Roderjan 1994; Maack 2012; Alvarez et al. 2013). With only 12% of the Atlantic Rainforest remaining (Ribeiro et al. 2009), efforts to catalogue its species are extremely necessary. Even the

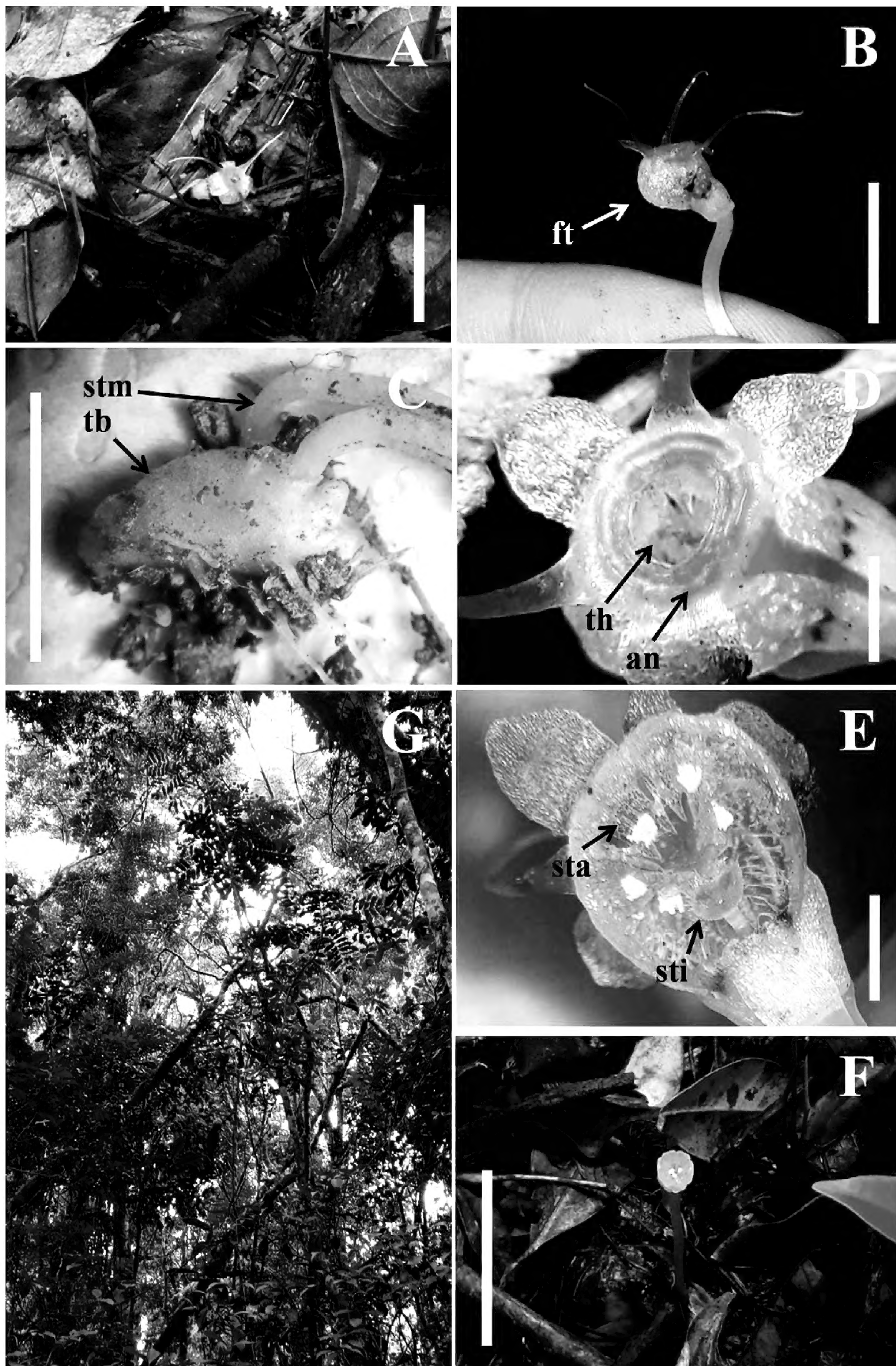


Figure 1. *Thismia panamensis* (Standley) Jonker. **A.** Individual with flower *in situ*. **B.** Zygomorphic floral tube (ft). **C.** Tuber (tb) with two steams (stm). **D.** Annulus (an) and throat (th). **E.** Stamens (sta) and stigma (sti) in detail. **F.** Individual with fruit *in situ*. **G.** Aspect of vegetation where specimens were collected. Scale bars: A–C = 10 mm; D, E = 1.5 mm; F = 30 mm.

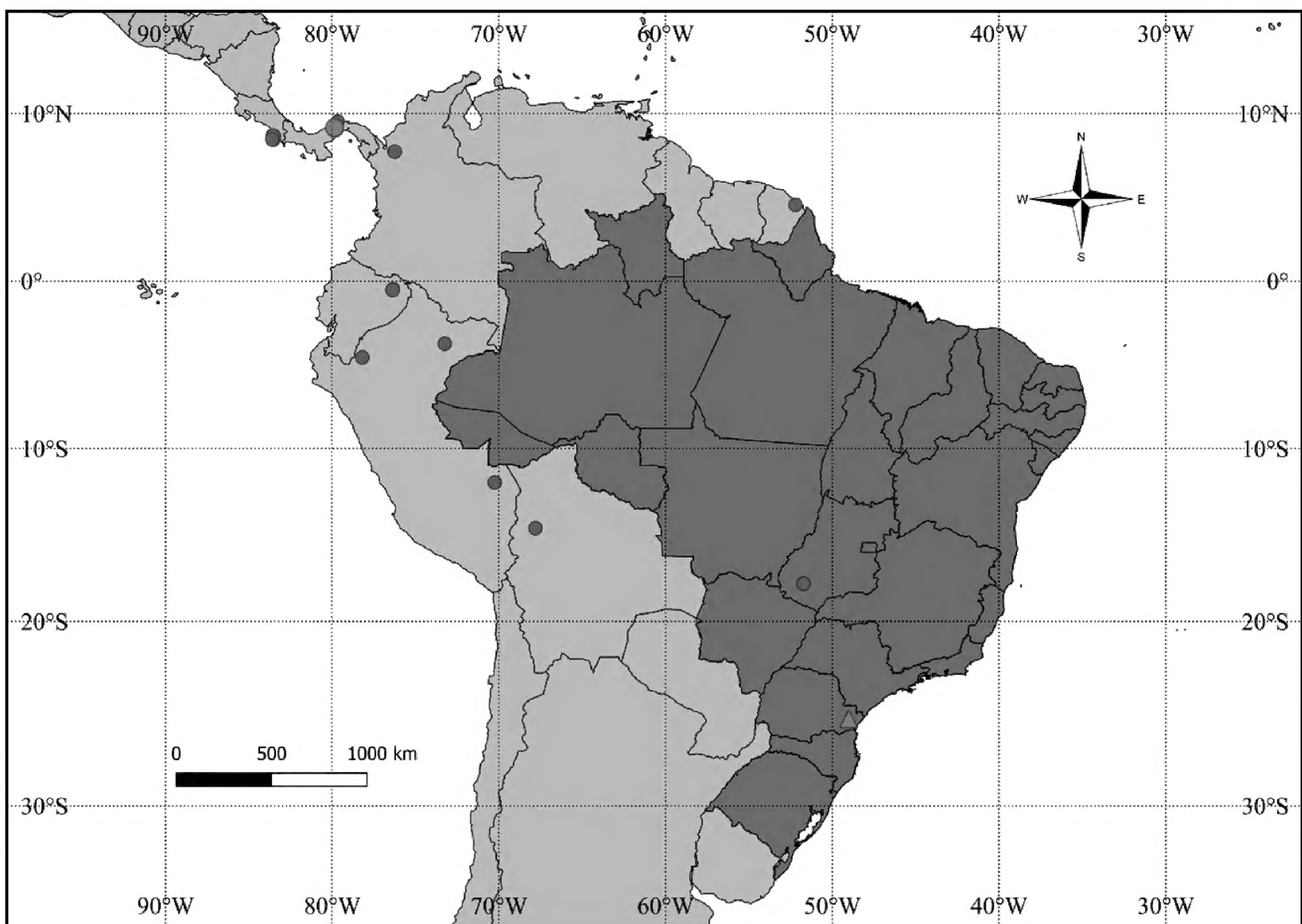


Figure 2. Geographical distribution of *Thismia panamensis* (Standley) Jonker in the Neotropics: type locality (red dot), other previous records (blue dots), and the new record (red triangle).

Serra do Mar region, where 36% of the Atlantic Rainforest remains intact, still suffers from human pressure (Ribeiro et al. 2009; Laurance 2009). Climate change is also a possible threat to mycoheterotrophic plants, as they depend on moist conditions for their development (Sainge et al. 2017).

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